

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
31 December 2003 (31.12.2003)

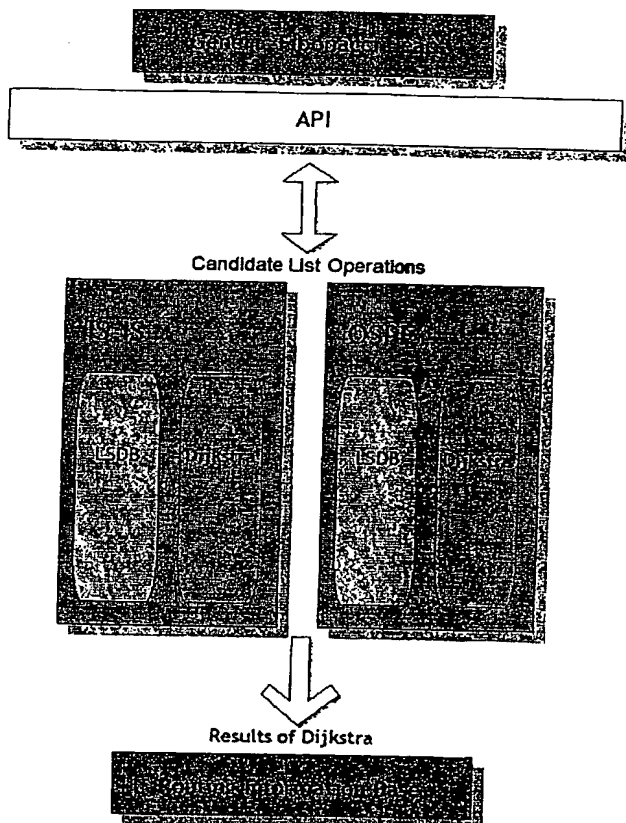
PCT

(10) International Publication Number
WO 2004/001621 A3

- (51) International Patent Classification⁷: **G06F 15/173**
- (21) International Application Number: **PCT/US2003/019674**
- (22) International Filing Date: **20 June 2003 (20.06.2003)**
- (25) Filing Language: **English**
- (26) Publication Language: **English**
- (30) Priority Data:
60/390,576 **21 June 2002 (21.06.2002)** **US**
- (71) Applicant (for all designated States except US): **NEXTHOP TECHNOLOGIES, INC. [US/US]; 825 Vectors Way., Suite 100, Ann Arbor, MI 48176 (US).**
- (72) Inventor; and
- (75) Inventor/Applicant (for US only): **AMATO, Nicholas [US/US]; 690 Canterbury Ct., Saline, MI 48176 (US).**
- (74) Agents: **HODES, Alan, S. et al.; Morrison & Foerster LLP, 755 Page Mill Road, Palo Alto, CA 94304 (US).**
- (81) Designated States (national): **AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.**
- (84) Designated States (regional): **ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).**

[Continued on next page]

(54) Title: **FIBONACCI HEAP FOR USE WITH INTERNET ROUTING PROTOCOLS**



(57) Abstract: In accordance with an aspect of the invention, one or more shortest paths is determined through a portion of a computer network, from a source vertex to one or more destination vertices according to a link-state protocol. A graph representation of the network portion is processed. The graph representation includes nodes and edges representing the vertices and connections therebetween. The processing includes operating on the graph representation according to a Dijkstra-like algorithm. A subset of the Dijkstra-like algorithm processing includes candidate list processing, to maintain and operate upon a candidate list (OSPF, IS-IS) of nodes that have been visited in the Dijkstra-like algorithm processing. Finally, the candidate list processing is optimized relative to standard Dijkstra algorithm processing for the link-state protocol. The optimized candidate list processing may be, for example, such that the candidate list processing operates on a candidate list of nodes that is stored in a generic format, as a Fibonacci heap of Fibonacci nodes in a generic format that is independent of the link-state protocol. Furthermore, the candidate list processing may be accessible via a generic application programming interface (API). As a result, the candidate list processing is useable for various link-state protocols, including various link-state routing protocols such as OSPF and IS-IS.

BEST AVAILABLE COPY